

Texas A&M University

Flight Research Laboratory



Introduction

About Us

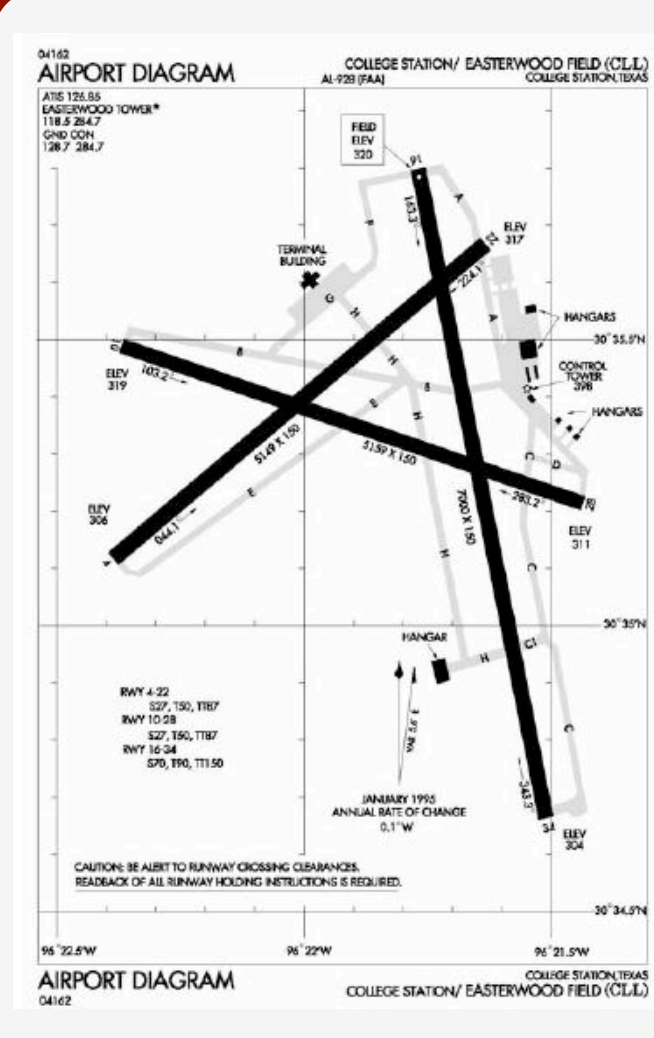
The Flight Research Laboratory (FRL) offers flight testing services in College Station, TX, out of Texas A&M University’s Easterwood Airport.

Our primary research program seeks to achieve drag reduction on swept wings through the use of laminar flow control. In addition, our team and our aircraft are available for a wide variety of flight tests, having completed projects in instrumentation qualification, aircraft dynamics, atmospheric quality sampling, aerial photography, and more.

The FRL is directed by Dr. William Saric and is supported by a full-time A&P Mechanic, several graduate and undergraduate students, experienced test pilots, and affiliated faculty.

Easterwood Airport (KCLL) and the FRL Hangar

College Station, TX



- Operates as Class D airspace
- Two low-traffic VFR testing areas available near the airport
- Light-traffic airport at ~180 operations per day
- Fire and rescue services on-site
- Three intersecting runways help with crosswind limitations when in test configuration
- Close proximity to wind tunnels
- 6000 sq. ft. hangar: 4000 sq. ft. for aircraft, 2000 for offices and electronics/instrumentation
- Composites workshop, sheet metal workshop, mill, and lathe



Aircraft



Cessna O-2A Skymaster, N630AM

Our primary research platform

- Militarized version of the Cessna 337
- 4 hard-points @ 350 lb capacity each, used at FRL for mounting test models & instrumentation
- Two-engine, centerline thrust configuration
- Full instrument rack in rear of cabin
- Seating for pilot, safety observer, and flight test engineer
- Useful load of 1750 lb, MTOGW 4300 lb
- Available power: 120A @ 24VDC, 600W @ 110VAC

Velocity XL-5 RG, N632AM

Kit-built all-composite aircraft

- Pusher / canard configuration for clean upstream flow quality for testing
- Useful load of 1100 lb
- Used as platform for AERO 425 Flight Test Engineering course, for air quality sampling, and aerial photography



Stemme S-10V, N631AM

- High-performance powered glider – propellers retract into nose cone in glide configuration
- 75.5 ft wing span, 50:1 glide ratio
- Selected for 2-D wing and zero-noise operation



Instrumentation

Hotwire and Hotfilm Anemometry

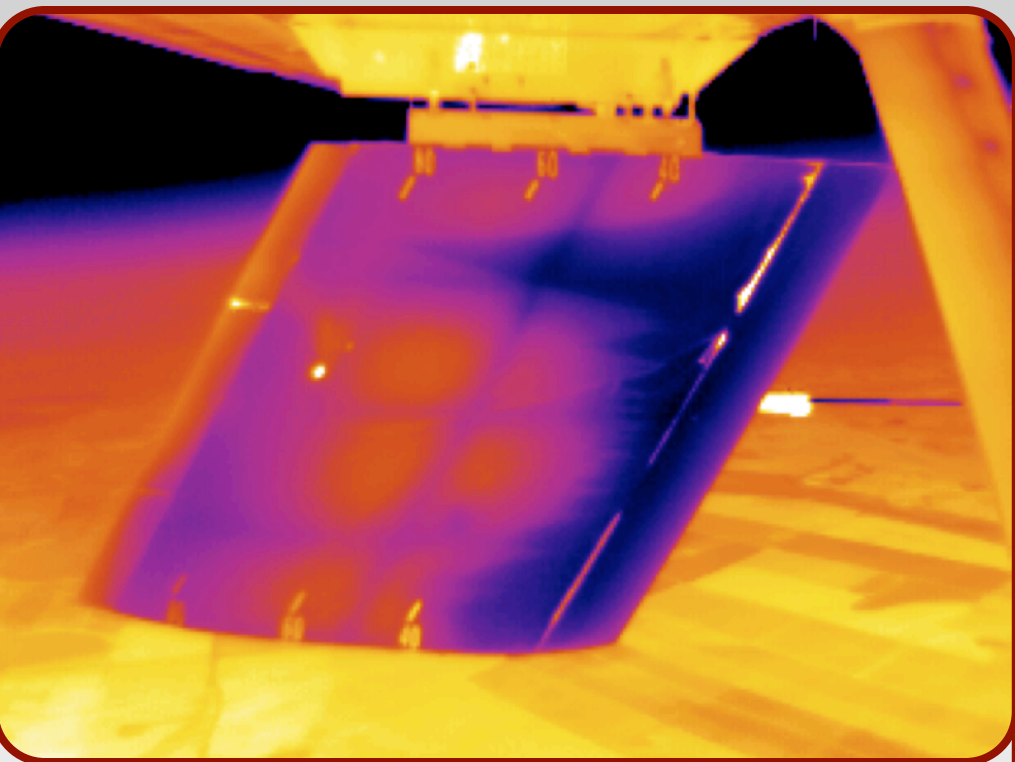
High-accuracy, high-frequency velocity & shear stress



- Used for measuring spatial/temporal spectra of surface shear stress or free-stream turbulence
- 30 anemometer & filter channels available
- A.A. Lab Systems AN-1003 CTA systems

Infrared Thermography

Global transition location diagnostic



- Enables visualization of laminar-turbulent transition due to differing surface heating rates
- FLIR ThermoCam SC3000 : 8-9 μ m range
- Merlin Mid: 3-5 μ m range

Air Data Measurement

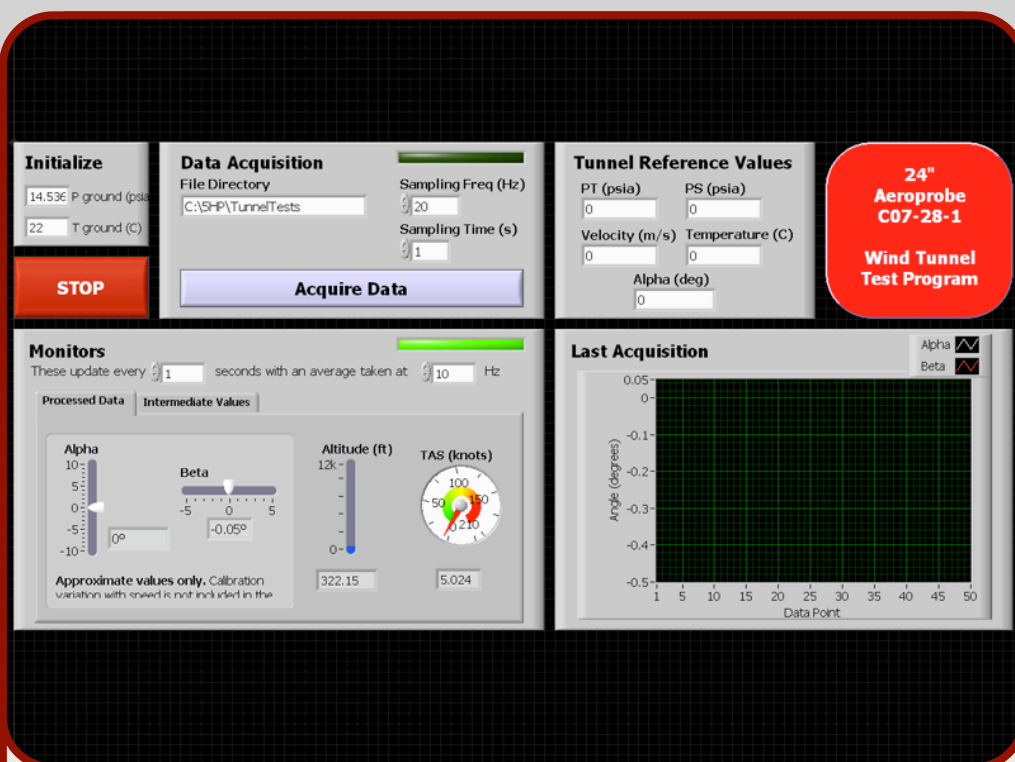
Vane and 5-hole probe styles available



- Measures angle-of-attack, angle-of-sideslip, dynamic pressure, and static pressure
- Typically integrated with pilot heads-up display for Reynolds number and angle-of-sideslip

Data Acquisition

Fully-customized solutions using NI LabView software



- Software customizable to each tests’ needs
- Many channels of 12- and 16-bit analog input and output are available, plus digital I/O, and image capture cards

Research

SWIFT (Swept-Wing In-Flight Testing)

Laminar Flow Control

- An effort to extend the region of laminar flow on a swept wing using spanwise-periodic discrete roughness elements (DRE)
- Laminar flow test article designed by FRL personnel
- Aircraft and mounting structures were analyzed and reinforced as necessary to accommodate loads: factor of safety 2+ to yield everywhere



Velocity Flow Field Analysis

Integrated Computation and Experiment



- **Goal:** determine the effect of the wake from the canard on the main wing
- Aircraft measured in 3-D to create an accurate computer model, then flow computed in Fluent
- 19-probe pressure rake constructed and flown
- Excellent agreement between CFD, experiment for both the location and strength of wake

Other Projects

- In-flight shear stress measurement with an optical shear stress sensor
- Atmospheric sampling (CO , NO_x , SO_2 , O_3)
- In-flight testing of wireless strain gauges
- AERO 425 Flight Test Engineering course
- Aerial photography

